Can SNOMED International Represent Patients' Perceptions of Health-Related Problems for the Computer-Based Patient Record?

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As the United States moves towards a computer-based patient record, there is much discussion related to the contents of such a record and the manner in which the data elements will be represented. Recent health care reform has emphasized the need for increased patient involvement in health care decision making, however, there has been little discussion about including the patient perspective in the computer-based patient record. Using an existing data set of 201 patients who were hospitalized for Pneumocystis carinii pneumonia, this study examined the ability of SNOMED International to represent patients' perceptions of health-related problems. The majority of concepts used by patients to describe health-related problems could be matched with existing SNOMED terms. The addition of the social context module as an adjunct to existing terminologies of medical diagnoses, NANDA diagnoses, and signs/symptoms provided additional matching terms. Patient goals did not match existing SNOMED terms. The findings of this study suggest that SNOMED International has the potential to adequately represent patients' perceptions of health-related problems for the computer-based patient record. Additional studies are needed that will examine the extent to which patients' perceptions of health-related problems are already documented in the patient record by healthcare providers. The utility of patients' perceptions of health-related problems in the prediction of patient outcomes must also be analyzed.

INTRODUCTION

The Institute of Medicine report on the computer-based patient record identified the standardization of health care vocabularies as a prerequisite for the patient record of the future and recommended a collaborative effort towards establishing a composite clinical data dictionary [1]. In addition, the report identifies a patient problem list and the systematic measurement and recording of patient's health status and functional level as attributes of computer-based patient records. While a few studies have tested the ability of existing vocabularies to represent medical or nursing concepts in the patient record [2-5], no studies were located that focused on the terms used by patients to describe their health-related problems.

Patient Perceptions

The significance of patient perceptions of health-related problems has been identified by several authors. Reiser [6] stressed the importance of making the experience of individuals with illness significant features of health care practice, education, research, and policy. Longo [7] proposed a new model for examination of practice variation that includes "patient practice style variation". He stated that "studies of outcomes must take advantage of what is known about patient problem perception, problem status measurement (by contrast with health status assessment), patient satisfaction, sick role and illness behavior in a life style context, and characteristics and dimensions of disease as experienced through the eyes of patients" (p. YS83).

SNOMED International

SNOMED International [8] is a compilation of nomenclatures that classifies patient findings into eleven modules or taxonomies: 1) *topography* - anatomic terms (12,385 records); 2) *morphology* - changes found in cells, tissues, and organs (4,991 records); 3) *living organisms* - bacteria and viruses (24,265 records); 4) *chemicals, drugs, and biological products* - drugs, chemicals, and plant products (14,075 records); 5) *function* - signs and symptoms (16,352 records); 6) *occupation* - terms to describe occupations (1,886 records); 7) *diagnosis* - diagnostic terms used in clinical medicine (23,623 records); 8) *procedure* -

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administrative, therapeutic, and diagnostic procedures (27,033 records); 9) *physical agents, forces, and activities* - devices and activities commonly associated with disease (1,355 records); 10) *social context* - social conditions and relationships of importance in medicine (433 records); and 11) *general* - syntactic linkages and qualifiers (1,176 records). Nomenclatures in SNOMED include ICD-9-CM [9], DSM-III-R [10], Current Procedural Terminology [11], and North American Nursing Diagnosis Association Taxonomy 1 [12].

Evaluation Studies

Three studies were located which tested a version of SNOMED with data from the patient record. Chute et al. [2] conducted an empirical evaluation of concept capture for 675 surgical diagnoses using three medical nomenclatures, the UMLS Metathesaurus, ICD-9-CM, and SNOMED II. Concept match scores were assigned for the natural language terms and for the base concepts (main concept stripped of modifiers) using a semi-automated coding tool based on lexical matching. The eight category nominal concept scores ranged from complete to poor match based on hierarchical classification relationships. For example, a broad match corresponds to a hierarchical parent concept. SNOMED II consistently outperformed the other two classification systems due to the atomic nature of its terms, however, none of the three systems captured more than 60% of the clinical terms. Campbell et al. [3] evaluated the clinical utility of Meta 1.1, which included SNOMED II, to describe the process of ambulatory care related to management of hypertension based on 2,500 progress notes from the COSTAR ambulatory care system. The progress note terms were matched into UMLS semantic types based on machine-assisted, manual review of clinical concepts. Matches for clinical concepts were: subjective, 68%; objective, 20%; assessment, 75%, plan, 64%, and overall, 58%. Henry et al. [4] examined the feasibility of SNOMED III to represent nursing concepts. Forty-four percent of the terms recorded by the nurse were direct matches with one SNOMED III term. These were primarily NANDA diagnoses and single signs or symptoms. Two SNOMED III terms were required to represent 10% of the nursing terms charted. More than two SNOMED III terms were needed to match the terms used by nurses in 130 instances. Overall, 69% of the terms recorded by nurses were matched by using one or more SNOMED III terms. The addition of the NANDA Taxonomy I classification scheme to SNOMED III provided exact matches for the nursing diagnoses in the data set in these analyses. However, NANDA terms alone were not sufficient to represent the broad variety of terms recorded by nurses in the nursing care plan and in the nurses' progress notes/flowsheet. Other SNOMED III terms were direct matches for the signs and symptoms recorded by the nurses to describe patient problems. Using NANDA terms alone provided matches for 30% of the patient problems described. The inclusion of other SNOMED III terms and combinations of SNOMED III terms increased the percent of matches to 69%.

METHODS

Research Question

The question addressed in this descriptive study is: Can SNOMED International terms represent patients' perceptions of health-related problems?

Sample

The data source for the patients' descriptions of health-related problems was more than 600 patient interviews conducted as part of a larger study examining the quality of nursing care of persons living with AIDS (PLWAs) hospitalized for *Pneumocystis carinii* pneumonia. Each patient was asked to identify his three or four major problems in interviews that were conducted during hospitalization and at three and six months post-hospitalization. The total number of unique text strings used to describe problems was 1259.

Procedure

All patient problems were entered verbatim into a relational database. Each problem was placed into one of the following categories: medical diagnosis, nursing diagnosis, sign/symptom, patient goal, or

other. Matches were manually identified by the investigators by locating the SNOMED International term that most closely matched the main concept in the patient's description of the health-related problem rather than the natural language terms. For instance, the patient statement "Fear about what is going on" was coded as fear, and the patient statement "throwing up alot" was coded as emesis/vomiting (F-52770).

RESULTS

As shown in Table 1, patients most frequently used sign/symptom terms (45%) to describe their problems with medical and NANDA diagnoses accounting for another 15% of the descriptions.

Table 1. Number of Problems by Category

Category	N	%
Medical Diagnosis	116	9
NANDA Diagnosis	77	6
Sign/Symptom	569	45
Patient Goal	89	7
Other	408	32

Problems described in sign/symptom, medical diagnosis, and NANDA terms can be represented by SNOMED International terms from a variety of modules including diagnoses, function, morphology, and living organisms (See Table 2). Descriptions of medical diagnoses such as CMV retinitis and *Pneumocystis carinii* pneumonia (PCP) require two terms joined by a relational modifier from the general module of SNOMED International. Some disease states are represented by terms from the morphology axis, ie. Kaposi's sarcoma (KS). Terms expressed as NANDA diagnoses and signs/symptoms primarily match with terms from the function module.

Table 2. Examples of Matching Terms

Concepts	SNOMED Terms
AIDS	DE-36310 - *AIDS, NOS*
CMV retinitis	DA-71020 - *Retinitis*
	G-C001 - *Due to*
	L-36500 - *Cytomegalovirus, NOS*
PCP	D2-50140 - *Pneumonia, NOS*
	G-C001 - *Due to*
	L-50F00 - *Pneumocystis carinii*
KS	M-91403 - *Kaposi's sarcoma*
SOB	F-20040 - *Dyspnea/shortness of breath*
Fever	F-03003 - *Increased body temperature/fever*
Boredom	F-92610 - *Boredom*
Memory deficit	F-0B180N - *Uncompensated short term memory deficit*
Anxiety	F-0B320N - *Anxiety*

Some of the problems classified as Other in the taxonomy coding scheme in the study can be represented by SNOMED terms from the social context. Examples of these terms are shown in Table 3.

Additional patient descriptions of problems classified as Other and not matched with SNOMED terms related to "dealing" with the system in areas such as disability and insurance forms or general complaints about the hospital such as noise level or food quality.

Problems described as patient goals were unable to be classified with SNOMED terms. Examples include "being more conscious of what my body's telling me", "building up strength so I can get back to work", and "eating without throwing up".

CONCLUSIONS

The majority of concepts used by patients to describe their health-related problems were

Table 3. Social Context Terms

S-11030	Celibacy, NOS
S-32030	Cigarette smoker, NOS
S-00040	Cultural deprivation
S-20500	Adjusting to work situation
S-30050	Disturbance in life pattern associated with community
S-30020	Disturbance in life pattern associated with family
S-30040	Disturbance in life pattern associated with recreation
S-30030	Disturbance in life pattern associated with work
S-30010	Disturbance in life pattern, NOS
S-20400	Economic problem
S-20480	Housing problem
S-50330	Poor
S-00070	Psychosocial deprivation
S-00030	Social isolation
S-00100	Unemployment

matched with existing SNOMED terms. The addition of the social context module as an adjunct to existing terminologies of medical diagnoses, NANDA diagnoses, and signs/symptoms provided additional matching terms. Patient goals did not match existing SNOMED terms.

The findings of this study suggest that SNOMED International has the potential to adequately represent patients' perceptions of health-related problems for the computer-based patient record. Additional studies are needed that will examine the extent to which patients' perceptions of health-related problems are already documented in the patient record by healthcare providers. The utility of patients' perceptions of health-related problems in the prediction of patient outcomes must also be analyzed.

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